PIET's College of Engineering, Pune- 5

End Semester Examination

(AS105)-Engineering Mathematics-II

Programme: F.Y.B.Tech.

Year: 2005- 06 Date: 13/07/2006

Duration: 3 Hours. Max. Marks: 60

Instructions: 1) All questions are Compulsory.
2) Figures to the right indicate marks.
3) Solve any TWO sub questions from Question II to VI
4) Use of non- programmable calculators is allowed.
5) Draw neat diagram wherever necessary.

Q.1) Choose the correct option 10

(i) The differential equation $(x^3+3xy^2)dx+(y^3+3x^2y)dy=0$ is ....

(a)Exact but non-homogeneous (b)Homogeneous but non-exact
(c)Non-exact (d)Exact & homogeneous

(ii) The purpose of Fourier series is to obtain a convergent series from non-sinusoidal function to sinusoidal series. This statement is ...

(a) True (b) False

(iii) The value of $\int_0^{\pi/2}\sin^6\theta\,d\theta$ is ....

(a) $\frac{6\pi}{12}$ (b) $\frac{\pi}{12}$ (c) $\frac{7\pi}{12}$ (d) $\frac{5\pi}{12}$

(iv) If we interchange role of variables x & y in equation of a curve, then equation leaves unaltered, So the curve is symmetrical about ....

(a)Line y = x (b)Line x = 0 (c)Both axes (d)None of these

(v) The value of $erf_c(-x)+erf_c(x)$ is ....

(a) 1 (b) 0 (c) ∞ (d) 2

Q.2) (a) Find the Fourier series representation for the function defined by 05
$f(x)=x\sin x \quad ; 0\le x\le 2\pi$

(b) Deduce the Fourier series of the function $f(x)$ defined by 05
$f(x)=x^3 \quad ; -1\le x\le 1$

(c) Obtained the half range sine series of 05
$f(x)=x\sin x \quad ; 0<x<\pi$

Q.3)

(a) Evaluate using reduction formula, the integral $\int_0^{\pi/4}\frac{\sin^4\theta}{\cos^5\theta}d\theta$ 05

(b) Prove that $\int_0^{\infty}e^{-st}erf(\sqrt{t})dt=\frac{2}{s\sqrt{s+1}}$ 05

(c) Evaluate $\int_0^{\alpha^2} \tan^{-1}\left(\frac{x}{\alpha^2}\right)dx$ 05

Q.4) (a) Trace the curve $x^4 + y^4 = 2a^2xy$ 05

(b)Evaluate the integral $I = \iint_R \frac{a}{(a^2+r^2)^{3/2}} dA$ where R is the region of the entire plane. 05

(c)Evaluate $\iiint_V xyzdxdydz$ where V is the volume bounded by the planes $x = 0, y = 0, z = 0, x + y + z = 1$. 05

Q.5) (a) Solve : $\left(\frac{y}{(x-y)^2} - \frac{1}{2\sqrt{1-x^2}}\right)dx - \frac{x}{(x-y)^2}dy = 0$ 05

(b) Solve : $x(x^2+1)\frac{dy}{dx} = y(1+x^2) + x^3 \ln x$ 05

(c) Solve : $\left(y + \frac{y^3}{3} + \frac{x^2}{2}\right)dx + \left(\frac{x+xy^2}{4}\right)dy = 0$ 05

Q.6) (a) Suppose the equation of an L-R circuit with e.m.f. $10sint$ is given by $L\frac{dI}{dt} + RI = 10\sin t$. If I = 0 when t = 0, express I as a function of t. 05

(b) find the area inside the circle $r = \sin\theta$ and outside the cardioide $r = 1 - \cos\theta$. 05

(c) Find the volume of the portion of the sphere $x^2 + y^2 + z^2 = a^2$ lying inside the cylinder $x^2 + y^2 = ay$.